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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/589,399	08/14/2006	Guo-Quan Lu	124617.00118	7126

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EXAMINER	
TAKEUCHI, YOSHITOSHI	
ART UNIT	PAPER NUMBER
1793	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/589,399	LU ET AL.	
	Examiner	Art Unit	
	YOSHITOSHI TAKEUCHI	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 November 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-20 are presented for examination.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1-3 and 5-6 and 8-13 are rejected under 35 U.S.C. 103(a) as obvious over Basol (US 2004/0219730).

Basol is applied to claims 1-3 and 5-13 for the same reasons as provided in the prior Office action.

4. Claims 4, 7 and 14-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Basol (US 2004/0219730) in view of Kodas et al (US 2003/0108644).

a. Basol in view of Kodas is applied to claims 4 and 14-20 for the same reasons as provided in the prior Office action.

b. Regarding claim 7, Basol teaches a method comprising the step of: sintering (¶ 0040) silver (¶ 0041) particles of a particle size of less than about 200 nm, and preferably less than about 100 nm (¶ 0035), which are positioned on contacts on the device and the substrate (¶ 0009 and Figure 4, item 42) and sandwiched therebetween; and said sintering step forming a metal or metal alloy layer from said metal or metal alloy particles (abstract), wherein said metal or metal alloy, prior to said step of sintering, is present in the form of a paste which comprises a dispersant associated with the metal or metal alloy particles, said dispersant being present in sufficient quantity to reduce or prevent agglomeration of said metal or metal alloy particles, and a binder (¶0037, wherein "said

dispersant being present in sufficient quantity to reduce or prevent agglomeration of said metal or metal alloy particles" is implied since the dispersant is added to disperse).

Basol does not expressly teach a method "for forming an interconnect which performs at least one of mechanically, thermally or electrically connecting a device to a substrate," but it would have been obvious to a person of ordinary skill at the time of the invention to use the method of Basol to make an interconnect because Basol teaches a method of adding a thin layer of metallic nano-particles for electrical devices, where adding a thin layer of metallic nano-particles would be advantageous to minimize the size of an interconnect.

Basol does not expressly teach the binder "having a temperature of volatilization below the sintering temperature of said metal or metal alloy particles." However, it is suggested, since Basol teaches, "[i]t is preferred that the carrier be a volatile material that once evaporated…leaves substantially no residue behind that would have deleterious effect…. The same is also valid for all the other chemical agents used in the precursor formulation." (¶0037, emphasis added). As a result, it would have been obvious to a person of ordinary skill at the time of the invention to use a binder with a "temperature of volatilization below the sintering temperature of said metal or metal alloy particles" in the Basol method since such a binder would "substantially no residue behind that would have deleterious effect," as taught by Basol.

Response to Arguments

5. Applicant's arguments filed October 8, 2009 have been fully considered but they are not persuasive. The applicants make the following arguments.

c. First the applicants argue, "Basol fails to disclose that the binder has 'a temperature of volatilization below the sintering temperature of said metal or metal alloy powder' as recited in independent claims 1, 7, and 14. The applicant further argues, "only the carrier is disclosed as being volatile and evaporated out of the wet micro-layer. In the same paragraph, the carrier is disclosed as being 'a water-based or organic solvent.'" Response to the Office action, pp.6-7.

In response, the examiner respectfully notes Basol teaches the following:

> It is preferred that the carrier be a volatile material that once evaporated out of the wet micro layer, leaves substantially no residue behind that would have deleterious effect on the compound film. The same is also valid for all the other chemical agents used in the precursor formulation. (¶0037, emphasis added).

As a result, Basol teaches or suggests a volatile binder, which would be expected to have a temperature of volatilization below the sintering temperature of said metal or metal alloy.

d. Second the applicants argue a *prima facie* case of obviousness has not been made because Basol discloses a semiconductor film layer and methods for forming that layer. *See, e.g.,* abstract, and paragraph [0017]. A highly desirable property of an electrical interconnect is its high conductivity. A semi-conductor by its nature makes a very poor electrically interconnect, because of its relatively poor conductivity (hence it is called a 'semi-conductor'). One of ordinary skill in the art would never use a semi-conductor as an electrical interconnect."

In response, in the art of manufacturing semiconductors, the chip designer considers both the conductor and the insulator (i.e. the "semi-conductor") when designing a chip. In addition, solar cells and integrated chips are sister industries. For example,

companies in the semiconductor equipment manufacturing industry (SEMI) cater to both the integrated chip and solar cell industries. As a result, the Basol and the instant invention are in related industries with similar technologies, so a person of ordinary skill in the art would consider the Basol patent when considering making an interconnect for a semiconductor device.

e. Third the applicant argues the combination of Basol and Kodas fails to render the instant invention obvious, stating that Kodas does not cure the deficiency of Basos, as discussed above.

In response, the examiner refers to the response *supra*.

f. Fourth the applicants argue "'compounds containing…Ag' are not the same as metallic silver. Chemically, a 'compound' is a substance formed by a reaction between silver and another element." Response to the Office action, p.9.

In response, the $Cu(In,Ga)(S,Se)_2$ (hereinafter, "SIGS") compound is known in the art to be a metallic polycrystalline mixture, typically deposited by physical vapor deposition. While the Basol patentee called the SIGS composition a "compound," the understanding of the art is SIGS is a polycrystalline composition. See e.g. Yan et al, Microstructure of Surface Layers in Cu(In,Ga)Se2 Thin Films, NREL/CP-520-33615 (May 2003). As a result, the silver and other components of the SIGS composition are metallic elements, such as metallic silver.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YOSHITOSHI TAKEUCHI whose telephone number is (571) 270-5828. The examiner can normally be reached on Monday-Thursday 9:30-3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dr. Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Roy King/
Supervisory Patent Examiner, Art Unit 1793

/YOSHITOSHI TAKEUCHI/
Examiner, Art Unit 1793